

1

IMAGE REPRODUCTION SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention

5

The present invention relates to an image reproduction system, and, more particularly to an image reproduction system for preferably use in a video printing system for printing out image information stored on a video tape.

Related Background Art

10

Hitherto, a video printing system 1 arranged as shown in Fig. 9 and capable of printing out an image signal by a video printer 11 thereof has been known, the image signal being supplied from a video camera 10.

15

The printing-out operation in the video printing system 1 shown in Fig. 9 is performed as follows. First, a picked up image signal is transmitted from video camera 10 to the video printer 11 as an analog signal. The transmitted imaged signal, that is, a picture signal, is monitored on a display 12. On the other hand, the

20

aforsaid analog signal is converted into a digital signal by an A/D converter 110 in the video printer 11. A desired picture is stored in a field memory 111 at the timing specified by an operation key 116 as a still image. The stored picture is arbitrarily confirmed in such a manner

25

that it is displayed on the display 12 when a switch 115 is

1 switched on by manipulating the key 116. Then, information
stored in the field memory 111 is supplied to a printing
image unit 114 so as to be printed out by the printing
image unit 114.

5 However, in the conventional video print system 1, it
takes about one minute for the video printer 11 to print
out one picture and the field memory 111 for only one
picture is provided. Therefore, when printing of a
plurality of pictures is desired, there is a necessity of
10 waiting for completion of the operation of printing out one
picture at the time of searching the next picture from the
tape by a searching operation. Therefore, it leads to
inconvenience at the time of the operation and a problem
arises in that a too long time is required for a user to
15 complete the printing operation.

In a case where a video tape recorder (VTR) for
outputting a video signal in the form of a digital signal
is connected to the aforesaid video printer, a buffer
memory for processing the digital signal must be provided
20 in addition to the aforesaid field memory. Therefore, a
problem arises in that the cost cannot be reduced and the
overall system cannot be made compact because the circuit
becomes too complicated.

In general, in a case where a picture corresponding to
25 a video signal reproduced from a video tape recorder (VTR)

1 is printed out by a printer, a desired picture in the reproduced signal supplied from the VTR is received by a memory in the printer and video data is read out from the memory at a predetermined speed so as to be printed out.

5 Fig. 18 is a schematic view which illustrates a system of the aforesaid conventional type. Referring to Fig. 18, reference numeral 281 represents a VTR, 282 represents a monitor and 283 represents a video printer. Then, the operation of printing out a desired picture selected from a
10 multiplicity of pictures recorded on a tape will now be described briefly.

First, the VTR 281 is set to a reproduction mode in which the reproduced video signal supplied from the VTR 281 is caused to be supplied to the monitor 282 and the printer
15 283. An operator operates the manipulation unit of the printer 283 at the timing when a desired picture is displayed on the monitor 282 while confirming the pictures on the monitor 282. In response to the operation thus performed, a control unit 285 causes a memory unit
20 284 to store video signal corresponding to one field (hereinafter called to "one picture") by controlling the memory unit 284. When the memory unit 284 receives the video signals which correspond to the one picture, it reads out the video signals at a predetermined speed which
25 corresponds to the printing speed of a printing unit

1 286. As a result, a desired picture can be printed out by
the printing unit 286.

Hitherto, analog video signals are generally supplied
from the VTR 281 to the printer 283.

5 In a conventional system of the type described above,
even if a plurality of pictures on one tape are printed
out, the following operation must be repeatedly performed:
one picture is selected, and then it is printed out while
taking a relatively long time of about one minutes for each
10 picture and then the next picture is selected. Therefore,
in a case where a multiplicity of pictures are printed out,
the operator must operate the system until all of the
pictures have been printed out while performing required
manipulations.

15 In a case where there is a desire of again printing
out a picture which has been once printed out, it is
substantially impossible to again select the same picture.
That is, since the VTR records video signals for about 30
to 60 fields per second in a case of, for example, an NTSC,
20 it records pictures of about 430,000 fields on a video tape
capable of recording pictures for 120 minutes. Therefore,
it is substantially impossible to again retrieving a
specific picture from the aforesaid number of pictures.

1 SUMMARY OF THE INVENTION

An object of the present invention is to provide an image reproduction system capable of completely or independently overcoming the aforesaid problems and an
5 image reproducing device and an image forming device which constitute the aforesaid system.

Another object of the present invention is to provide an image reproduction system capable of easily forming images of a plurality of pictures.

10 In order to achieve the aforesaid objects, according to one aspect of the invention, there is provided an image reproduction system comprising: detection means for detecting an index signal recorded to a recording medium together with an image signal and specifying a picture to
15 be printed; setting means for setting retrieving conditions for retrieving the picture to be printed; extracting means for extracting an index signal which corresponds to the retrieving conditions thus set; and image forming means for image-forming the picture specified with the extracted
20 index signal.

Another object of the present invention is to provide an image reproduction system which is composed of an image reproducing device and an image forming device and the functions of which are properly allocated to the aforesaid
25 devices.

1 Another object of the present invention is to provide
an image reproduction system capable of quickly retrieving
a desired picture from an image forming device.

5 Another object of the present invention is to provide
an image reproduction system capable of transferring a
desired picture to an image forming device at high speed.

Another object of the present invention is to provide
an image reproduction system having a novel function.

10 Other and further objects, features and advantages of
the invention will be appear more fully from the following
description.

BRIEF DESCRIPTION OF THE DRAWINGS

15 Fig. 1 is a schematic structural view which
illustrates an embodiment of a video print system according
to the present invention;

Fig. 2 is a schematic structural view which
illustrates the video print system according to the
20 embodiment of the present invention in a state where
information is being reproduced;

Fig. 3 is a schematic structural view which
illustrates the video print system according to the
embodiment of the present invention in a state where
25 information is being recorded;

1 Fig. 4 illustrates a recording track pattern on to an
8 mm video tape;

Fig. 5 is a flow chart which illustrates the operation
of the video print system according to the embodiment of
5 the present invention;

Fig. 6 is a flow chart which illustrates the operation
of the video print system according to the embodiment of
the present invention;

Fig. 7 illustrates an example of a mode which can be
10 set by combining the compression/expansion method of the
picture data and the photographing method;

Fig. 8 is a graph which illustrates the relationship
between the compression mode and the data quantity;

Fig. 9 is a schematic structural view which
15 illustrates a conventional video print system;

Fig. 10 is a flow chart which illustrates an example
of the partial printing operation in the automatic printing
process;

Fig. 11 illustrates an image picture on a tape formed
20 by the operation shown in Fig. 10;

Fig. 12 is a flow chart which illustrates another
example of the partial printing operation in the automatic
printing process;

Fig. 13 illustrates an image picture on a tape formed
25 by the operation shown in Fig. 12;

1 Fig. 14 illustrates a state in which storage to a
buffer memory 65 shown in Fig. 2 is made;

 Fig. 15 illustrates a state in which storage to a
buffer memory 65 shown in Fig. 2 is made;

5 Fig. 16 illustrates a state in which storage to a
buffer memory 65 shown in Fig. 2 is made;

 Fig. 17 illustrates a state in which storage to a
buffer memory 65 shown in Fig. 2 is made;

10 Fig. 18 is a block diagram which illustrates another
conventional system;

 Fig. 19 is a structural block diagram which
illustrates another embodiment of a video print system
according to the present invention;

15 Fig. 20 is a block diagram which illustrates a VTR
unit of the system shown in Fig. 19;

 Fig. 21 illustrates a recording format for use in the
embodiment of the present invention;

 Fig. 22 illustrates record data for use in the present
invention;

20 Fig. 23 is a timing chart of data in the data bus;

 Fig. 24 illustrates an allocation of data in the data
bus;

 Fig. 25 is a flow chart which illustrates the
operation of the embodiment shown in Fig. 19;

25 Fig. 26 illustrates an example of the formed print;

1 Fig. 27 illustrates an example of the formed print;
and

Fig. 28 illustrates a format of a multiple picture.

5

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Preferred embodiments of the present invention will now be described with reference to the drawings.

10 Fig. 1 is a schematic structural view which illustrates an embodiment of a video print system 100 according to the present invention.

The system 100 comprises a VTR unit 90, which is an image reproducing device, an analog signal input terminal
15 20a capable of receiving an analog signal supplied from a video camera 20 or the like, a video printer unit 14 for receiving a digital signal supplied from the VTR unit 90 via a data bus 26 or an analog signal transmitted from the video camera 20 so as to print out pictures and a data
20 compression/expansion unit 80 to be described later, the video printer unit 14 being an image forming device.

A buffer memory 65 is structured so as to be used commonly when it is properly switched at the time of the operation in such a manner that it serves as a buffer
25 memory for a data bus in a case where it receives the

1 signal in a digital manner under control of a controller 67
for the printer and it serves as a frame memory when a
still image is extracted from an analog kinetic image
signal at the specified timing made by a key input switch
5 76.

An analog signal transmitted from video camera 20 is
quantized into a digital signal by an A/D converter 61 so
as to be transmitted to a terminal of a data selector 77.
A printer 91 receives an output signal (image information)
10 from the selector 77 via the buffer memory 65.

The VTR unit 90 comprises a VTR body 90a, a key
input switch 46 serving as an input unit and a
controller 42 for a cam coder serving as a retrieving
unit. As a result, print retrieving information about
15 an image to be printed can be recorded by an inputting
operation performed with the key input switch 46 when image
information is recorded on an 8 mm video tape 41. The
digital signal denoting the image to be printed is supplied
to another end unit of the data selector 77 via
20 interfaces 27, 64 and the data bust 26.

Then, taking the 8 mm video tape 41 as an example, the
way of recording various information items on the tape 41
by the VTR body 90a will now be described with reference to
Fig. 4 in the forming order of the recording tracks from a
25 lower unit to an upwards diagonal direction. Fig. 4

1 illustrates the pattern of the recording tracks formed on
the tape 41. As shown in Fig. 4, the tape 1 stores the
following recorded information items: PCM region 1, INDEX
region E2 and VIDEO region E3.

5 The PCM region E1 is a region in which digital data is
recorded at a data rate of 0.5 M to 1.5 Mbps. In the PCM
region E1, 8 to 16 bit quantizing stereo audio data, or
field/frame digital still image information, and ID words
10 (which consists of ID0 to ID5 and to which the sound
quality, and the image quality and date of photography, and
the like are recorded) for sub-code information about the
aforesaid digital still image information, the sink and the
address for re-constituting data, and a PQ parity for
detecting an error or a CRCC for correcting an error, and
15 the like.

The INDEX region E2 is a region in which data is
recorded by using a technology similar to that used at the
time of the PCM recording operation and which is composed
of a search signal serving as print retrieving information
20 for retrieving and a data signal. A state where all of
data items are of the search signal are "0" means a normal
state, while a state where all of that are "1" means an
input of a head searching signal. Data signal is
interposed between S (start block) and END (end block), and
25 5 blocks composed of data blocks BLO to BL4 are disposed in

1. the data signal. Each block is composed of data words "WDO" to "WD4" and "CRCC". Since each word WD is capable of recording 8 bit data, the number of sheet to be printed out and the like can be set by an outer recording operation of
- 5 the INDEX region E2.

The frequency spectrum distribution of VIDEO region E3 is arranged in such a manner that 4-frequency pilot signal (4f) for tape tracking at the time of reproduction is located in the lowest frequency region so that the analog

- 10 image signal is recorded as brightness FM signal and low frequency conversion color signal and the analog audio signal is recorded as monaural FM signal or a summation and subtraction stereo signal ($L + R$, $L - R$) and a sound multiplex (man and sub) FM signal.

- 15 Data can be independently recorded/reproduced to and from the aforesaid information regions E1 to E3. For example, a digital still image can be additionally recorded to the tape on which only analog information has been recorded or PCM sound can be recorded afterwards.
- 20 Furthermore, a specification of a head searching signal for specifying a picture for the printing operation, or that of the size of the sheet to be printed, or that the number of the sheets to be printed can be given to the tape 41 which has been photographed or edited.

1 Then, the schematic structure of each unit of this
system 100 will now be described with reference to Fig. 2
which is a schematic structural view illustrating
information reproducing process performed by this system
5 100.

 The aforesaid data compression/expansion unit 80
comprises an A/D converter 21, a D/A converter 60, a frame
memory for storing a digital image signal, a first and
second compression/expansion circuits 23a and 23b for
10 compressing/expanding the digital image signal, a mode
selection switch (SW1) 24, a switch (SW5) 49, a switch
(SW2) 48 capable of selecting the image signal or still
image information and interfaces (I/F) 24 and 44.

 The VTR body 90A of the aforesaid VTR unit 90
15 comprises an audio processing circuit 33 for subjected
supplied audio signal to a predetermined process, an analog
signal processing circuit 34 for subjecting the supplied
image signal to a predetermined process, a tracking servo
circuit 38 for transmitting the 4-frequency pilot signal
20 (4f), an addition distributing device 36, a rate converting
circuit 28 for converting image data into a predetermined
data rate, a sub-code data generating circuit 30 for
generating mode information, and date information, and the
like as ID words of PCM data, a PCM processing circuit 29
25 for writing mode information or the like supplied from the

1 aforesaid sub-code data generating circuit 30 together with
still image data (SV data) to the PCM region E1, time-
division signal distributing device (SW3) 37 for
sequentially supplying the information items to heads 40a
5 and 40b disposed on a recording rotational drum 39 at the
time of the recording mode in order to form the track
pattern as shown in Fig. 4 on the tape 41, the time-
division signal distributing device (SW3) 37 distributing
the information items in a time-sequential manner at the
10 time of the reproduction mode according to the contents of
information. The VTR body 90a further comprises an index
information generating circuit (INDEX) 35 and an A/D
converter 75.

The aforesaid circuits 27 to 36 have both of the
15 recording and reproducing functions and act inversely in
the reproduction mode and the recording mode.

The video printer 14 comprises a buffer memory 65 for
storing an image signal supplied through the analog image
signal input terminal 20a via the A/D converter 61 and the
20 data selector (SW6) 77 or an image signal supplied through
the interface (I/F) 64, the image signal being stored as a
still image. The video printer 14 further comprises first
and second expanders 68 and 69 for expanding still image
data stored in the buffer memory 65 in a contrary manner to
25 that at the time of the recording operation and a frame

1 memory 71 for storing expanded image data via a selector
(SW6) 70 as a still image information to be reproduced and
a printing unit 72 for generating a video printed image
by using the aforesaid still image information stored in
5 the frame memory 71. The video printer 14 further
comprises a printer controller 67 for controlling the each
unit of the video printer 14 in accordance with control
data supplied via the interface (I/F) 66 and an input
signal for selectively operating the selector (SW6) 70
10 supplied from the key input switch 76. The first and
second expanders 68, 69, the selector (SW6) 70, the frame
memory 71 and the printing unit 72 constitute a printer
91. The aforesaid buffer memory 65 acts to supply
information about the vacant capacity of the buffer memory
15 65 to the printer controller 67. The printer controller 67
controls the state of occupancy of the buffer memory 65 due
the storage of data in accordance with information about
the vacant capacity supplied from the buffer memory 65.

The thus structured operation of the video printing
20 system 100 according to this embodiment will now be
described with reference to the drawing.

First, an operation to be performed at the time of
recording information will now be described. At the time
of the recording operation, the VTR unit 90 is connected
25 to, for example, a video camera. An image signal

1 photographed by the video camera 20 is processed by the
analog signal processing circuit 34 in a known manner for
the 8 mm video taper recorder. The audio signal received
by a microphone 31 is amplified by an amplifier 32 before
5 it is processed in a known manner for the 8 mm video tape
recorder by the audio processing circuit 33. The 4-
frequency pilot signal (4f) supplied from the tracking
servo circuit 38 for the known 8 mm video tape recorder is
added to the image signal and the audio signal processed in
10 predetermined manners in the circuits 33 and 34 by the
adder 36 so that the signal to be recorded to the aforesaid
VIDEO region E3 is generated before it is supplied to the
time-division signal distributor (SW3) 37. When
information such as a calender or a clock or the like for
15 use in a so-called automatic date function possessed by the
aforesaid video camera 20 are set by the key input switch
46, the aforesaid information items are supplied to the cam
coder controller 42. The INDEX 35 generates information to
be recorded to the INDEX region E2 under control of the
20 controller 42 so as to supply it to the time division
signal distributor (SW3) 37. In a case where the audio
signal is recorded to the PCM region E1, the output from
the amplifier 32 is selected by a selection circuit
(omitted from illustration) by the operation of the key
25 input switch 46, so that the input signal to be supplied to

1 the PCM processing circuit 29 is selectively switched to a
still image information to be described later by the cam
coder controller 42.

5 Since the PCM process for the 8 mm video field is a
known technology, its description is omitted here for the
purpose of simplifying the description.

The image signal photographed by the video camera 20
is converted into a digital image signal by the A/D
converter 21. Timing (shutter release timing) specified by
10 the key input switch 46 or an interval pulse automatically
generated is transmitted to the frame memory 22 by the cam
code controller 42, so that writing of the digital image
signal to the memory 22 is inhibited at the moment writing
of a desired image is completed and a still image (SV) is
15 received. The received image can be monitored at need by
operating the switch (SW2) 48 on an electronic view finder
(EVF) 45 which usually displays kinetic image.

The still image data is supplied to the first image
data compressing circuit 23a and the second image data
20 compressing circuit 23b so as to be supplied to the mode
selection circuit switch (SW1) 24 as three types of still
image data, that is, non-compressive and raw data items
(composed data items 1 and 2). The three types of still
image data items are switched by the cam coder controller
25 42 by the key input switch 46. Selected image data is

1 transmitted to the I/F 25 so as to be transmitted to the
data bus 26. On the other hand, the cam coder controller
42 transmits mode information (the difference between the
non-compressed data, compressed data items 1 and 2) which
5 has been previously selected to the sub-code data
generating circuit 30. The PCM processing circuit 29
writes it as the ID word for PCM data together with date
information such as the aforesaid automatic date to the PCM
region 1 together with still image data.

10 The aforesaid image data, which has passed through the
data bus 26 and the I/F 26, is converted into data rates of
0.5 to 1.5 Mbps by the rate converting circuit 28, the data
rates 0.5 to 1.5 Mbps being the same as that of the PCM
audio data. The image data is then subjected to the PCM
15 signal process together with the aforesaid sub-code before
it is supplied to the time-division signal distributor
(SW3) 37.

The time-division signal distributor (SW3) 37
sequentially selects PCM information, INDEX information and
20 VIDEO information corresponding to the PCM region E1, the
INDEX region E2 and the VIDEO region E3 when viewed from
the head scanning direction so as to form the recording
track pattern as shown in Fig. 4. The selected information
is supplied to the heads 40a and 40b formed on the

1 recording rotational drum 39 so that the track pattern as
shown in Fig. 4 is formed on the tape 41.

Then, the process to be performed at the time of
reproducing information will now be described with

5 reference to Fig. 2.

An assumption is made that information track as shown
in Fig. 4 is formed on the tape 41. While tracking the
aforesaid track in such a manner that the capstan 19 and
the rotational drum 39 are controlled by the servo circuit
10 38, the recorded information signal is detected by the
heads 40a and 40b formed on the rotational drum 39. The
detected signal is processed by the time-division signal
distributor (SW3) 37 in such a manner that each information
is distributed to the PCM region E1, the INDEX region E2
15 and the VIDEO region E3 in a time division manner and
according to the contents of information.

Information (the analog signal) in the VIDEO region E3
is divided according to the frequency spectrum by the
addition distributor 36 so that the signals are supplied
20 starting from the lower frequency spectrum in such a manner
that the pilot signal 4f is supplied to the servo circuit
38, color information c is supplied to the analog signal
processing circuit 34, audio information (AFM) is supplied
to the audio processing circuit 38 and brightness
25 information Y is, similarly to color information c,

1 supplied to the analog signal processing circuit 34. As a
result, they are subjected to the known 8 mm video signal
process. As a result, a satisfactorily tracked image and
audio signal are transmitted to the output terminals 73 and
5 74. The image signal can be selectively displayed at need
by the switch (SW2) 48 by the cam coder controller 42
similarly to still image information to be described later.
Another example may be employed in which an image process
such as a known "picture in picture" process is performed.

10 Information in the INDEX region E2 is subjected in
such a manner that a data group as shown in Fig. 4 is
reproduced by the INDEX 35 so as to be supplied to the cam
controller 42. The head searching operation for the
printing out process is performed by rotating the capstan
15 at a high speed by the aforesaid servo circuit 38 until the
search signal (e.g. a signal, all of data items of which
are "1") written in the INDEX region E2. When the servo
circuit 38 detects the search signal, all of data item of
which are "1", it reads print information (information
20 about the number of sheets and the size) set to the VIDEO
region E3 so as to transmit it to the cam coder controller
42. The aforesaid data items are transmitted to the data
bus 26 via the I/F 43 so as to be received by the video
printer unit 14 at need.

1 Information in the PCM region E1 is processed in such
a manner that the still image data, which is the main data,
and the ID word, which is the sub-code data, are
respectively subjected to the reproduction process by the
5 PCM processing circuit 29. The audio rate (0.5 m to 1.5
Mbps) of the still image data is converted in an opposite
manner to that at the time of the recording operation by
the rate converting circuit 28 so as to be adapted to the
data rate of the data bus 26. The audio rate is then
10 transmitted to the data bus 26 via the I/F 27. At this
time, the still image information is transmitted to the
video printer unit 14 via the data bus 26 in a state it
is compressed together with compression mode information.

 The cam coder controller 42 transmits the still image
15 information for the image monitoring operation to the
ensuing first and the second compressing/expanding circuits
23a and 23b via the I/F 25 and transmits the control
information to the same via the I/F 44.

 The switch (SW5) 49 selects non-compressed information
20 and each information substantiallyly expanded/restored to the
original image information by the first or the second
expanding process. The selection output signal from the
switch (SW5) 49 is stored on the frame memory 22 as a still
picture for one picture so a to be read out by the D/A
25 converter 60 at the video rate. Then, it is supplied to

1 the switch 48 as analog image information as described
above. If necessary, it is displayed on the image monitor
device such as an EVF 45.

Also the analog image signal can be printed out
5 similarly to non-compressed data of the digital still image
by converting it into digital data by the A/D converter 75
by inputting a head searching signal or the like to an
arbitrary picture of the kinetic image signal so as to
specify the still image.

10 The operation of the video printer unit 14 will now be
described.

In a case where the analog image signal is made to be
the input source, the aforesaid digital image information,
accompanying control data and ordinary image signal
15 supplied through the analog image signal input terminal 20a
is digitized by the A/D converter 61 before it is supplied
to the buffer memory 65 via the data selector (SW6) 77, so
that it is stored as a still image.

In a case where the aforesaid digital image signal is
20 made to be the input source, the transmitted image signal
has been supplied on the data bus 26 adjacent to the video
printer unit 14. Therefore, the video printer unit
14 receives image data of the aforesaid information is into
the buffer memory 65 adjacent to the printer unit 14 and the

1 printer controller 67 via the I/F 64 and receives control
data to the same via the I/F 66.

The output from the I/F 64 is supplied to the buffer
memory 65 via the data selector (SW6) 77. The buffer
5 memory 65 always transmits information about the space
capacity of the buffer memory 65 to the printer controller
67 in order to enable the printer controller 67 to control
the memory occupancy state due to the storage of data. The
first and second expanders 68 and 69 expand image data,
10 which have been temporarily stored, under control of the
printer controller 67 in a opposite manner to that
performed at the time of the recording operation. The
selector (SW6) 70 stores expanded image data together with
non-compressed data on the frame memory 71 as still image
15 information to be reproduced. The printing unit 72 is
controlled by the printer controller 67 so as to generate a
video print picture by using still image information.

The aforesaid data selector (SW6) 70 acts in
synchronization with the operation of switching the input
20 signal by means of the key input switch 76, so that the
selection operation is properly controlled by the printer
controller 67.

The automatic printing operation will now be described
with reference to an operation flow chart shown in Fig. 5

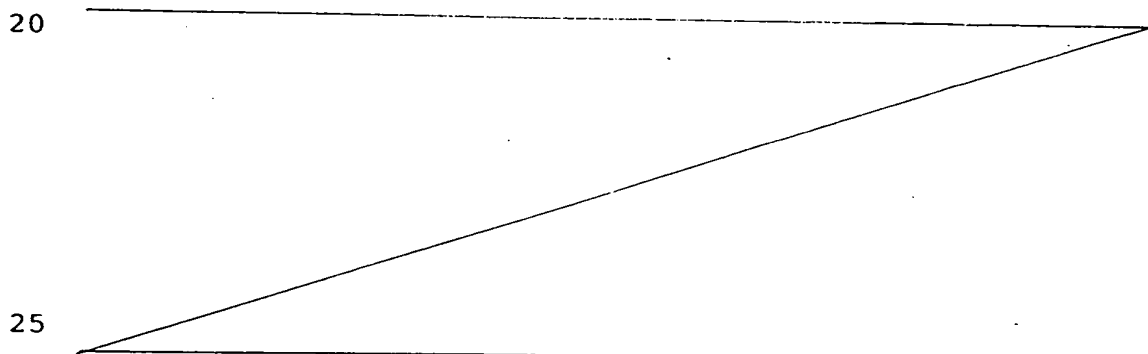
1 while centering on the operation of exchanging data between
the VTR unit 90 and the video printer unit 14.

When the operation is started, the servo circuit 38 in
the VTR unit 90 searches the video tape 41 under control
5 of the cam coder controller 42 (S1). The cam coder
controller 42 confirms whether or not the head-searching
signal has been detected from the INDEX region E2 (S2) and
causes the servo circuit 38 to continue its searching
operation until the fact that all of the data items are "1"
10 is detected in the head searching signal. If it is
detected, the rotation of the capstan 19 is stopped and the
flow proceeds to step S3 on the affirmative side. In this
step, the printer controller 67 requests print status
"PT·ST" for confirming the operation state of the unit
15 including the printer unit 14. The printer controller 67 in
the unit including the printer unit 14 which has received the
request transmitted via the data bus 26 confirms the state
of the buffer memory 65 (S4). The printer controller 67
receives information about the vacant capacity from the
20 buffer memory 65 so as to confirm that the memory has been
saturated (S5). If it has been saturated, the flow
proceeds to step S6 in which "PT·ST" is set to "Busy". If
there is a vacant capacity, "PT·ST" is set to "Free" (S7)
and "Free·Capa" is set according to the state of occupancy
25 of the memory (S8). The printer controller 67 transmits

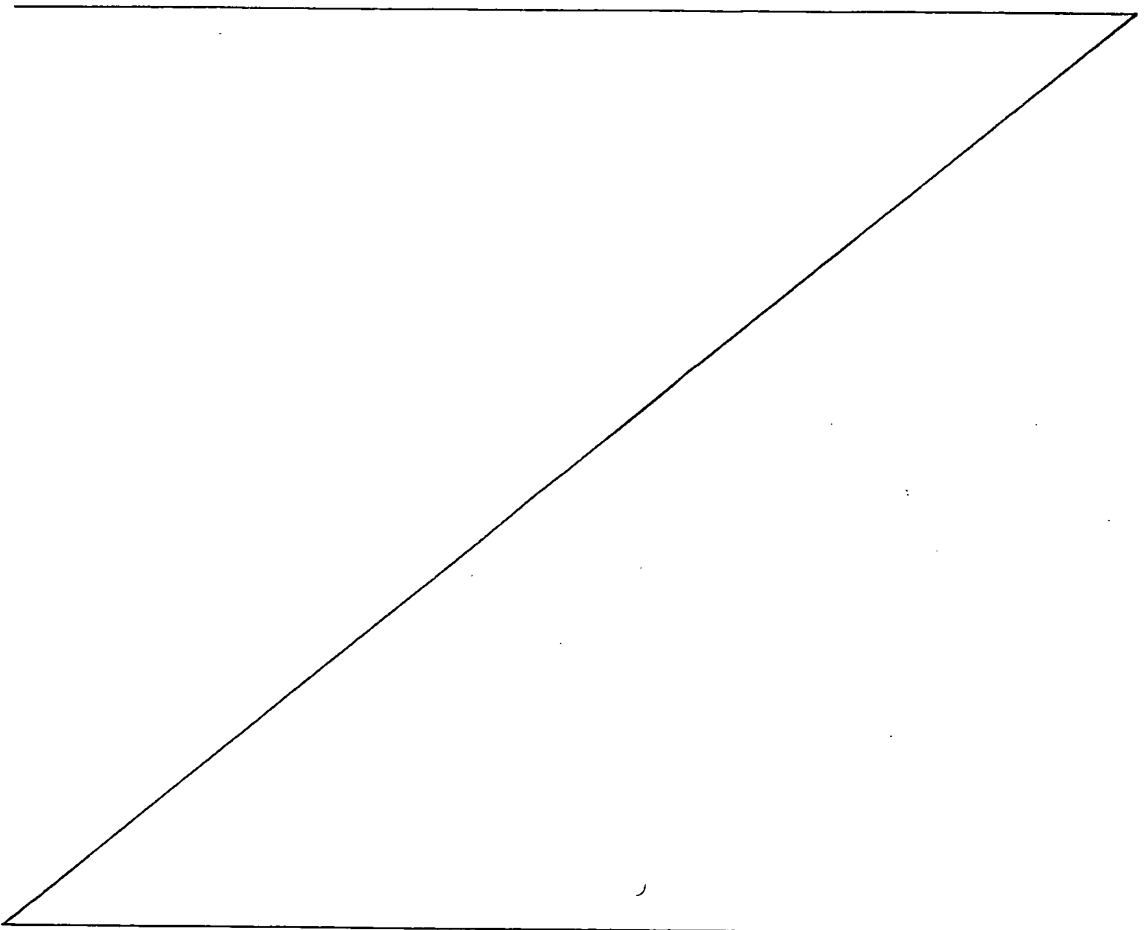
- 1 the thus set "PT·ST" information about the state of the
printer unit 14 and "Free·Capa (F.C)" information about
the vacant capacity of the buffer memory 65 to the data but
26 so as to be sent to the unit including the VTR
5 unit 90 (S9).

The cam coder controller 42 receives "PT·ST" and
"F.C" (S10). If "PT·ST" is "Busy" (S11), returning to said
step S3 and waiting till the operation of printer unit 14
become idle.

- 10 The printer controller 67 confirms the quantity of
still image data which corresponds to the head searching
signal found in step S2 if there is a vacant capacity in
the buffer memory 65 because "PT·ST" = "Free", the
confirmed data quantity being then set to D·C (data
15 capacity) (S12). The printer controller 67 reads out
information about information about the type of the
photography and the compression mode and it may specified
as shown in Fig. 7 or it may describe the capacity in the
sub-code as the number of bits.



25



1 (S14) and image data items are sequentially transmitted to
the data bus 26 (S15).

The printer controller 67 receives image data via the
I/F 64 (S16) and writes image data to the buffer memory 65
5 (S17). Then, the printer controller 67 checks data
transference (S18) and notifies the VTR portion 90 via the
bus line 26 that the completion of the operation of writing
image data to the buffer memory 65 if the checking
operation has been completed. When the cam coder
10 controller 42 discriminates the completion of the data
transference operation from the notified fact (S20), it
confirms the existence/presence of the instruction to
search the next head searching signal. If there is a left
"JOB", the flow returns to step S1 for the searching
15 operation and this operation is performed. If a
discrimination of "END of JOB" is made, the flow proceeds
to the affirmative side and the process is completed here.

The operation of the video printer unit 14 will now be
described with reference to an operation flow chart shown
20 in Fig. 6.

The printer controller 67 properly expands still image
data (expressed as "SV" in the flow chart) supplied from
the buffer memory 65 and receives it after the printer
controller 67 has developed still image data on the frame
25 memory 71 (S60). The printer side controller 67 receives

1 data about the printing out conditions and the like (the
size of the print and the number of prints) (S61). Then,
the printer controller 67 resets a print sheet number
counter N to "0" (S62). The printer side controller 67
5 sets the number of the prints received in step S61 to P
(S63). Then, the printing operation is commenced and
printing of one sheet is printed before the flow proceeds
to next step (S64). Then, the count of the counter N is
increased by one (S65), and then whether or not the number
10 N of the printed sheets has reached required number P is
discriminated (S66). If a negative discrimination is made,
the flow returns to step S64 in which the printing out
operation is continued. If an affirmative discrimination
is made, the flow proceeds to step S66. The original data
15 (compressed data) of still image data is deleted from the
buffer memory 65 after the printing out operation has been
completed (S67).

After the deletion in the step S67, it is discriminated
whether still image data to be printed still remain or not
20 (S68). If remain, the processing returns to the step S60.
When the buffer memory 65 becomes vacant, the processing
is completed.

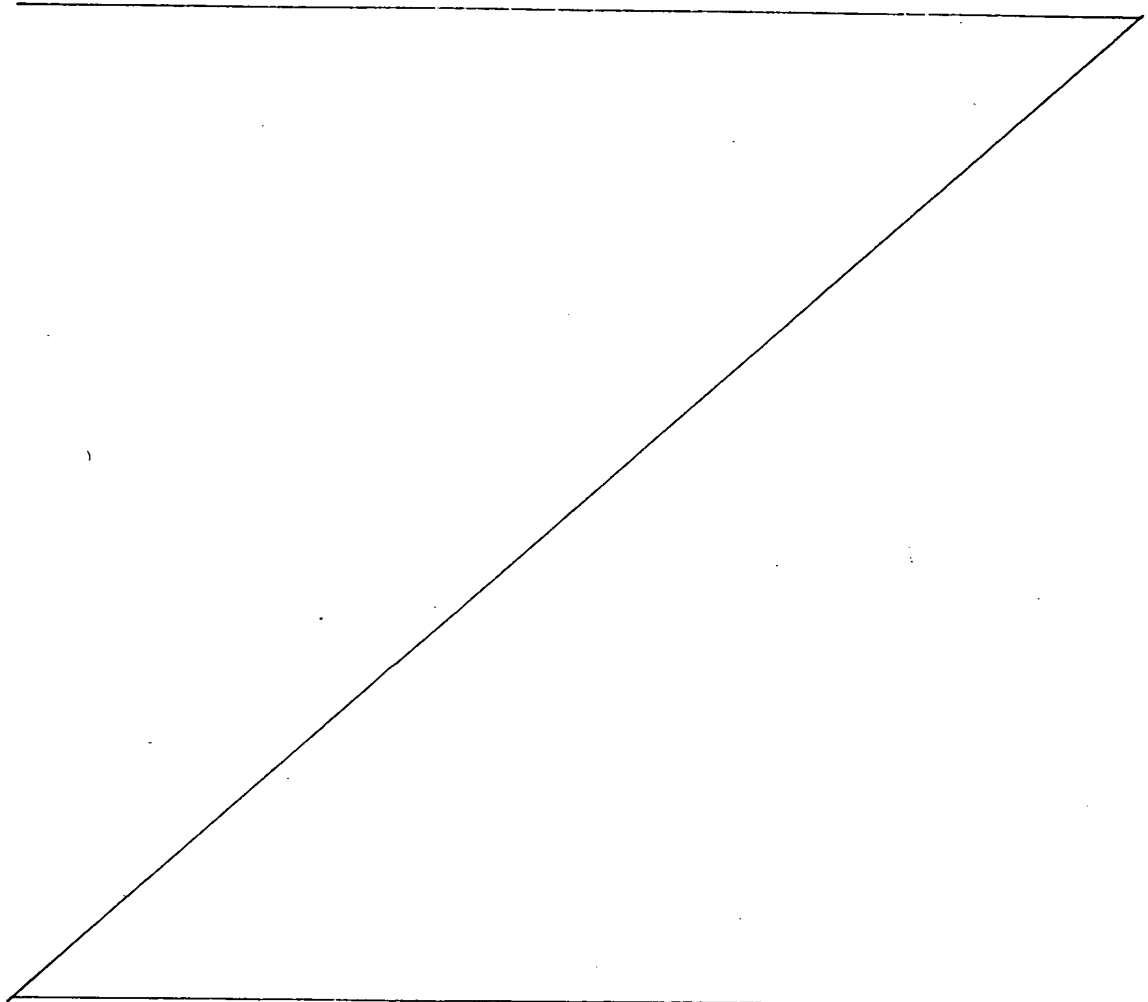
1 Fig. 7 illustrates examples of modes which can be set
by combining the methods of compressing/expanding image
data and the image pickup methods. As the image pickup
methods, the field and the frame of an NTSC (or PAL) field
5 photographing method and those of a so-called high-vision
TV which has doubled frame photographs and the number of
scanning lines are set. As the compressing method, a space
thinning sub-sample, or a quantizing operation DPCM, or a

10

15

20

25



1 block coding orthogonal conversion DCT, or a JPEG, or the
like can be utilized. Fig. 7 illustrates an example of the
aforesaid combinations expressed as 4-bit modes 1 to 16 as
the modes.

5 Fig. 8 illustrates results of calculations of the data
quantities which correspond to the aforesaid modes 1 to 16
and the number of pictures stored in the memory while
assuming a buffer memory capable of storing non-compression
information about an HD frame picture by a quantity of only
10 one picture.

As described above, data for several to several tens
still image can be stored in one buffer memory 65 according
to the mode.

According to the aforesaid embodiment, an example is
15 described in which the buffer memory 65 is commonly used as
the buffer memory for processing the digital signal and the
frame memory for processing the analog signal. However, it
can be used as a field memory in place of the frame memory.

According to the aforesaid embodiment, when image data
20 is transferred from the VTR unit 90 to the printer
unit 14, the operation state of the printer unit 14
can be confirmed and the searching operation to be
performed by the VTR unit 90 can be controlled according
to the state of the printer. Therefore, by previously
25 recording print retrieval information on the video tape 41,

1 a video printer system capable of performing an automatic
printing process by sequentially searching plural types of
pictures (immediately after the printing operation has been
completed) can be realized.

5 As described above, the complicated printing process
which takes a lot of time can be automated and therefore
the home video printing culture can be widely used.

Furthermore, in a case where a development to an
external printing laboratory is made in the present
10 photograph DPE system, the automation of the printing
process will realize an advantage. Therefore, a novel
electronic photography DPE culture can be created in which
a video tape, to which printing out information has been
inputted, is brought to a printer service shop capable of
15 printing a higher image quality.

Since the data transference to the buffer memory 65 in
the printer unit 14 is performed in a compression state,
the data transference speed can be raised, the number of
pictures which can be stored in the buffer memory 65 can be
20 increased and delay of the operation due to the busy state
generated in the operation of the printer unit 14 cannot
be easily generated. Therefore, the overall operation time
can be shortened.

1 Since two picture sources, that is, the analog input
and the digital input are provided, a variety of input
signals can be treated.

 According to this embodiment, the memories required
5 for each input section is constituted by the same memory
and it is switched to the buffer memory and the frame
memory or the field memory in synchronization with the
selection of the input signal. Therefore, the size of the
circuit can be made to be compact. Furthermore, the memory
10 capacity of the analog signal section can be used by the
digital signal section, causing design freedom to be
realized. Therefore, the aforesaid problem of time loss
due to the delay of the searching operation in the VTR
unit 90 caused from the "printer-busy", that is, the
15 full-operation of the buffer memory cannot be easily taken
place. As a result, an effect can be obtained in that the
overall printing time can be shortened.

 As described above, according to this embodiment, the
buffer memory and the frame memory or the field memory are
20 made of the common memory and the common memory is
selectively used as the buffer memory and the frame memory
or the field memory according to the state of selection of
the first input means for receiving the digital signal or
the second input means for receiving the analog signal.
25 Therefore, a video printing system can be provided which is

1 capable of satisfactorily shortening the time taken for the
user even if a plurality of pictures are printed out, with
which the printing operation can be automated, the overall
cost of which can be reduced and the structure of the
5 circuit of which can be simplified and made to be compact.

Another embodiment of the present invention will now
be described.

An example for automating the printing output
operation, which is the characteristics of the present
10 invention will now be described which has two modes
including a partial printing mode. Since the structure on
the viewpoint of the hardware is the same as the embodiment
shown in Fig. 2, only a flow chart which illustrates the
procedure of the process will now be described with
15 reference to Fig. 10.

According to this embodiment, a first mode is made to
be a full mode in which the overall data in a video
cassette is automatically collectively printed and a second
mode is made to be a part mode in which the number of
20 prints is specified and the specified part is automatically
printed. First, in step S90, an index counter P and an
index memory N are reset to zero. In next step S91,
branching to a first full mode and a second part mode is
made according to the mode which has been set. In a case
25 of the full mode, the tape is rewound to the tape head in

1 step S92, and then the flow proceeds to step S94. In the case of the part mode, the number of the pictures is set in the index memory N is set in step S93, and then the flow proceeds to step S94.

5 In step S94, the forward directional index search is performed, and then the flow proceeds to step S95 in which a completion discrimination is made whether or not search has reached the end unit of the tape. If it has not reached the end unit, the process is completed here. If
10 it has reached the end unit (EOT = End Of Tape), whether or not the index has been detected is discriminated in step S96. A loop arranged as S94 → S95 → S96 → S94 is repeated. If it has been detected, the flow proceeds to step S97. In step S97, print information (the number of
15 sheets, the size, and the like) and still image information are read from the tape.

In next step S98, the status (PT·ST) of the printer is confirmed. In a case of Busy, the flow proceeds to step S99 in which temporary waiting is performed and a loop
20 arranged as S98 → S99 → S98 is repeated until Free is again realized. If Free is realized, data read in step S97 is transmitted to data bus 26 in step S100.

In next step S101, the count of the index counter P is increased by only one, and then whether or not all of the
25 pictures corresponding to a predetermined number N of the

1 indexes have been processed is discriminated. If there is
a non-processed picture ($N > P$), the flow returns to step
S94. If it has been completed ($N \leq P$) the flow proceeds to
END and the aforesaid sequential process is completed.

5 Fig. 11 illustrates an image picture formed in a case
where a partial printing is specified by using the index
counter.

Assuming that the index counter is set to $N = 3$ with
respect to the process start point PS, the tape is sent in
10 the forward direction until the index number 3 is detected.
At this time, the tape sending operation is stopped at the
end point PE. If N is set to a negative number, the tape
sending is started in the opposite direction from the start
point PS and therefore the index searching operation is
15 started in the opposite direction. The process is
completed when the determined number is realized similarly
to the forward direction. In actual, the same index
information is continuously recorded for about 10 seconds,
that is, about 600 tracks converted, the configuration
20 becomes different from that shown in Fig. 11.

According to the automatic printing out process as
shown in Fig. 10, a partial image printing can be
automatically performed. Therefore, addition of printing
out can be enabled if necessary and therefore the use can

1 be varied. As a result, a convenient video printing system
can be constituted.

Another example of automating the printing out process
having the first full mode and the second part mode
5 similarly to the embodiment shown in Fig. 10 will now be
described with reference to a flow chart shown in Fig. 12.

According to this example, the first mode is made to
be a full mode for collectively automatically printing the
all information on a video cassette and the second mode is
10 made to be a part mode for automatically partially printing
information while specifying the image pickup period.

First, in step S90, period specification start
variable T1, completion variable T2 and a reverse flag Rv
are provided and each of them is reset to zero. In next
15 step S91, branching to the first full mode and the second
part mode is performed according to the mode which has been
set. In the case of the full mode, rewinding to the tape
head is performed in step S92, and then the flow proceeds
to step S94. In the case of the part mode, the subject
20 periods T1 and T2 are set by the key input operation
performed by a user with the key switch 76 or 46. Then,
the flow proceeds to step S94.

In step S94, the forward directional index search is
performed. Then, in step S95, a completion discrimination
25 whether or not searching has reached the tape end is made

1 in step S95. In step S96, whether or not the index has
been detected is discriminated and a loop arranged as $S94 \rightarrow$
 $S95 \rightarrow S96 \rightarrow S94$ is repeated until it is detected. If it
is detected, the flow proceeds to step S97. In step S97, a
5 time code (data and time of the photography and the like),
print information (the number of sheets or the size or the
like) and still image information are read from the tape.

In next step S98, time code "DATE" read in the
previous step S97 is subjected to a comparison with
10 variables T1 and T2 so as to confirm whether or not it is
information within the subject period for the printing out
operation. If $T1 \leq \text{DATE}$ or $T2 \geq \text{DATE}$, an affirmative
discrimination is made. Therefore, the data transference
is performed in step S99 because it is within the subject
15 period. That is, still image information and the like are
transmitted to the data bus 2. If $T1 > \text{DATE}$ or $T2 < \text{DATE}$,
a negative discrimination is made. Therefore, a fact that
the reversing of the searching direction has not been
performed is confirmed in step S100, and then the searching
20 direction is reversed in step S101. Then, the reverse flag
Rv is set to "1" in step S102 and the flow returns to step
S94 in which searching is performed. However, in the case
where the reverse searching has been started, the process
is completed at the moment $Rv = 1$ is detected in step S100
25 in order to avoid repeated searching of the same tape.

1 Fig. 13 illustrates an image picture formed in a case
where the time code and the search code are written to the
index region.

 A unit designated by diagonal lines is a unit to
5 which the search code is written and date entered below it
corresponds to the date of the photography. Although, the
distance between the marks (CP) is positioned away from
each other by several hundred times in actual, DATE is
written in the time sequential manner. For example,
10 assumptions are made that T1 = January 1, 1991 and T2 =
January 31, 1991, it can be understood that the subject
period for the printing output operation defined by T1 and
T2 are two pictures on January 1, 1991 and that January 15,
1991. In the aforesaid case in which only specific
15 pictures photographed in January 1991 are desired to be
printed, it can be performed by the aforesaid printing out
process.

 According to the aforesaid automatic printing process
as shown in Fig. 12, partial printing of the cassette can
20 be automatically performed by specifying the range by a
retrieval means which can be easily handled by the human
sensitivity. Therefore, a video printing system which can
be easily handled can be constituted.

 As described above, according to this embodiment of
25 the present invention, in a case where image data is

1 transferred from the VTR to the printer, the operation
state of the printer is confirmed, and then the VTR
searching operation is controlled according to the
operation state. Therefore, by previously recording print
5 data to the video tape, a plurality of pictures can be
sequentially searched and the printing out operation can be
automatically performed immediately after the printing
operation has been completed. As described above, the non-
efficient printing work, which has taken a too long time
10 according to the conventional technology can be automated.
Therefore, the home video printing culture can be promoted.

Furthermore, in a case where a development to an
external printing laboratory is made in the present
photograph DPE system, a novel electronic photography DPE
15 culture can be created in which a video tape, to which
printing out information has been inputted, is brought to a
printer service shop capable of printing a higher image
quality because the automatic printing can be enabled.

Since data is transferred to the printer side buffer
20 memory in a compressed state, the data transference speed
can be raised and therefore the number of pictures which
can be stored in the memory can be increased. Therefore,
the delay of the work due to the Busy state generated
during the operation of the printer can be prevented

1 satisfactorily and the time taken to complete the process
can be shortened.

As described above, according to this embodiment, the
structure comprises detection means for detecting an index
5 signal recorded to a recording medium together with an
image signal and acting to specify a picture to be printed,
setting means for setting conditions for retrieving the
picture to be printed, extracting means for extracting the
index signal which corresponds to the set retrieval
10 condition and printing means for printing only a specified
picture in response to the extracted index signal.

Therefore, in a case where a plurality of pictures are
desired to be printed, head searching can be automatically
performed by only performing the initialization by a user.
15 Therefore, only a desired picture can be automatically
printed and therefore the efficiency of the operation of
printing a part of a recording medium can be significantly
improved.

According to the aforesaid embodiment, the results of
20 rough estimation of the data quantity which corresponds to
the aforesaid modes 1 to 16 and the number to be stored in
the memory are shown in Fig. 8 while making the non-
compressed information about the HD frame picture to be a
reference and assuming a buffer memory capable of storing
25 only one picture. As described above, it can be understood

1 that data about several to tens of still images can be
stored in one buffer memory 65 according to the mode. A
specific example of the storage capacity of the buffer
memory 65 is shown in Figs. 14 to 17 while assuming that
5 the storage capacity of the buffer memory 65 to be data
about one picture which is not compressed. Referring to
Figs. 14 to 17, "A" is an image which is not compressed,
"B" and "C" are images which are compressed at a rate of
1/2, and "D" to "G" are image which are compressed at a
10 rate of 1/4. The image data item expressed by "A" is
stored by the buffer memory 65 as shown in Fig. 9, the
image data items expressed by "B" and "C" are stored by the
same as shown in Fig. 10, image data items expressed as "D"
to "G" are stored by the same as shown in Fig. 11 and image
15 data items expressed as "B", "D" and "E" are stored by the
same as shown in Fig. 12.

According to the aforesaid embodiment, when image data
transferred from the VTR unit 90 or the video camera 20
is temporarily stored in the buffer memory 65 of the video
20 printer unit 14, it is compressed according to the
compression rate. Therefore, the quantity of image which
can be stored can be enlarged and therefore the efficiency
of printing out a plurality of pictures can be improved.

1 Another embodiment of the present invention will now
be described with reference to Fig. 19 and ensuing
drawings.

Fig. 19 is a block diagram which illustrates an
5 embodiment of a video printing system according to the
present invention. Referring to Fig. 19, reference numeral
201 represents a video recording/reproducing apparatus
(VTR), 202 represents a monitor and 203 represents a video
printer. The VTR 201 comprises a camera integrated VTR 211
10 and a digital interface 301, the VTR 201 being connected to
a digital interface 520 in the video printer 203 by a data
bus. The video printer 203 includes required mechanisms
such as a memory unit 231, a system controller (also
called a "SYS-CON") 232, a picture-printing unit 233, a
15 character-printing unit 234, signal processing unit
238 and print paper 204. Reference numeral 230 represents
an operation unit which is attached or integrated with the
video printer. As a result, the operation unit 230 is able
to control the printing operation and the operation of the
20 VTR.

Fig. 20 is a block diagram which illustrates the
structure of the VTR body having structural units such as a
system controller 401, a servo system 402 and a drum 406
which are provided similarly to the conventional structure.
25 However, there is a difference in that operation control

1 signals (CS1, CS2 and clock data) are supplied/transmitted
to and from the system controller 401 via a digital
interface (I/F) 301 connected to a data bus 428 connected
to the printer.

5 Then, recording format of print data will now be
described with reference to Figs. 21 and 22.

As shown in Fig. 21, a print data area PA corresponds
to 1.5 horizontal scanning period (H) of the video signal.
That is, the aforesaid switch 409 is switched on in only a
10 period which corresponds to the aforesaid 1.5H. The area
for 1.5H is divided into an index unit for 1.26H and a
data unit for 0.24H as shown in Fig. 21. A head
searching signal to be described later is recorded to the
index unit, while print data is recorded to the data
15 unit.

As shown in Fig. 21, five word WDO to WD4, start
identifying data S, end identifying data E and error
correction CRCC are recorded to the data unit. Each of
the words WDO to WD4 is constituted by 8 bits and has the
20 contents as shown in (a), (b) and (c) of Fig. 22.

Fig. 22 (a) illustrates a date mode in which the date
and the day of the week and the error correction code are
expressed by 8 bits, Fig. 22 (b) illustrates a time mode in
which the time of the photography, the frame No, and the
25 error correction code are expressed by 8 bits and Fig. 22 (c)

1 illustrates a time series mode in which three time frame No.
from the start unit of the tape and the error correction
code are expressed by 8 bits.

The modes shown in (a), (b) and (c) of Fig. 22 may be
5 arbitrarily selected or a plurality (for example, those
shown in Fig. 22 (a) and 22 (c)) of modes may be alternately
recorded to the track.

The timing of each data on the data bus is shown in
Fig. 23. The upper units (a), (b) and (c) of Fig. 23
10 illustrate information called "VTR data" to be supplied
from the VTR to the printer, where (b) illustrates digital
still image information (VIDEO-DATA) and a VTP code. Fig.
23 (a) illustrates a signal of the line CS1 shown in Fig.
19, while Fig. 23 (b) illustrates data D shown in Fig. 19.

15 As shown in Fig. 23 (c), the VTP code is composed of
VTR STATUS code showing the state of the operation of the
VTR, words WD0 to WD4 of CODING-INDEX which are the
aforesaid 8 mm VTR sub-code data and print command data for
supplying various commands to the printer.

20 As shown in the timing chart (a), a change takes place
from "L" to "H" according to the transmission timing from
the VTR.

The lower portions (d), (e) and (f) illustrate
information to be supplied from a printer called a "PTV" to
25 the VTR, where (e) illustrates digital still image

1 information (VIDEO-DATA) and a PTV code. Fig. 23 (f)
illustrates a signal of line CS2 shown in Fig. 19, while
Fig. 23 (e) illustrates data D shown in Fig. 19. The data
line for (b) and (e) are made to be different lines or made
5 to be a common line in order to decrease the number of the
signal lines.

The PTV code is composed of PRINTER STATUS showing the
state of the printer as shown in Fig. 23 (f), WD0 to WD4
similar to Fig. 23 (c) and a video command which is a
10 command of the video operation.

The operation of a jog shuttle dial 305 or the like of
the operation unit 230 shown in Fig. 19 is transferred to
the VTR by using the aforesaid data area.

Fig. 24 illustrates a bit map for each information.

15 The aforesaid video command is illustrated in the
lowermost unit and arranged to instruct to write or read
coding index information or the like from a tape T with the
0-th bit and instruct a region to which reading/writing is
made with the first and the second bits. Since the PCM
20 sub-code has a multiplicity of information areas as well as
the INDEX, instruction can be enabled by identifying 4
units or less by using the two bits. The third bit
makes digital data such as PCM-SV to "H" when a command of
transferring image data is issued according to the
25 transference timing of video data shown in Fig. 23. The

1 fourth to the seventh bits are used to specify the VTR
search mode. With this, the following state of running can
be specified:

5 0 REWIDE
1 SEARCH X (- 20)
2 SEARCH X (- 5)
3 SEARCH X (- 1)
4 REVERSE X (- 1)
10 5 SLOW SPEED REV. PLAY
6 VERY SLOW SPEED REV. PLAY
7 STILL
8 STOP
9 VERY SLOW SPEED PLAY
15 ASLOW SPEED PLAY
BPLAY X 1
C SEARCH X 2
D SEARCH X 5
E SEARCH X 20
20 FFF

The four data words WD1 to WD4 are allocated in such a
manner that 2 bits are allocated to the sort number, two
bits are allocated to the magnification (print size) and
25 four bits are allocated to the number of prints. That is,

1 four types (four groups) of sort numbers can be set and
individual magnifications can be set to each of the types.
The number of prints can be set from 0 to 14 by using four
bits. In a case where all of the four bits are "1", a
5 special fact of multi-picture printing is meant. This
means a printing operation in which 25 pictures next to the
picture which is being reproduced is printed as one
picture. It means a state of printing which enables an
effect obtainable from a strip of contact print of a
10 photographic negative in a conventional silver salt
photography to be expected.

The word WD0 is a control word for controlling the
words WD1 to WD4 and includes one bit (the second bit)
which shows whether the print picture is made by data for
15 one field or data for one frame and one bit (the first bit)
which shows whether or not the printing operation has been
completed. The 0-th bit is a bit which shows whether or
not there is a print specified picture (hereinafter called
simply as a "parent picture" in 10 seconds immediately
20 before the picture to be printed. The setting of the 0-th
bit will be described later. The third to the seventh bits
are 5-bit data which shows the order of the frame defined
by the time code or the like to which the print picture
corresponds.

1 The operation of the system according to this
embodiment will now be described.

First, the schematic flow of the operation of the
video print system will now be described with reference to
5 Fig. 19.

Information supplied from the VTR unit 201 and
digitized by the digital I/F (interface) 301 is transferred
to the video printer 203 via the data bus. Additional data
such as image information, the control signal and the date
10 information is temporarily received by the I/F 520 before
it is supplied to the memory unit 231 and the system
controller 232.

The system controller 232 selects data and controls
the operation.

15 Date information and comment information supplied from
a character generator of the video camera 211 are converted
into video signals by a synthetic signal generating unit
238 for making it to be a visual image signal. Then, they
are synthesized with still image information transmitted
20 from the memory unit 231 by the synthesizing unit 237
at the time of closing the switch 591 so as to be printed
onto the print paper 204 by the picture printing unit
233.

On the other hand, information similar to the
25 aforesaid information is usually supplied to the character

1 printing unit 34 at the time of closing the switch 592
so as to be printed to a unit except for the picture
printing area of the picture printing unit 233 on the
print paper 204 by the character printing head. It may, of
5 course, be synthesized and printed to the print paper 204
and this case is included within the scope of the
invention.

Additional data to words WD0 to WD1 may be subjected
to the generation process by a bar code signal generator
10 541 as digital binary information as it is and printed on
the same paper 204 by the character printing unit 234.

When data is recorded, control is performed in such a
manner that the switch 593 is closed.

When the aforesaid three types of recording operations
15 are performed onto the same paper 204, a paper feeding
mechanism is caused by the system controller 232 to control
the paper feeding operation and the locating operation.

In order to perform processes relating to the time
such as the date and the time of the printing out operation
20 and the over all control by means of the timer, a calender
& clock 236 is included and information from it is
processed by the additional processing circuit 235 together
with data WD0 to WD4.

The operations of the aforesaid switch 239 (591 to
25 593) is detected by the operation unit 521 which

1 controls the manual operation buttons such as the mode
selection switches 501 and 502 provided for the printer 203
and is processed by the system controller 232 so as to be
selection-processed as a SELECT signal.

5 The sensor unit 522 is a detection processor for
reeding bar code information shown in the lower left
portion of Fig. 26.

The aforesaid operation is performed while being
confirmed by an image/audio (AV) monitor device 302
10 connected to the VTR 201.

The video signal reproduced by the
recording/reproducing unit 201 is supplied to the
monitor device 202. An operator operates the camera
integrated VTR 11 by the operation unit 230 provided for
15 the printer while observing an image displayed on the
monitor device 202.

That is, the fast winding or rewinding operation is
performed while searching the image until a desired picture
to be printed out comes closer and the picture is retrieved
20 while confirming the image by performing the slow speed
reproduction or the still reproduction operation. The
aforesaid operations are performed by using the known jog
shuttle dial 505 or a pause button 503.

A VTR search operation command generated at the time
25 of the aforesaid operation is supplied to the data bus

1 shown in Fig. 19 and data is transferred between the I/F
520 and the I/F 301 before it is supplied to a remote
control terminal (for example, a rank terminal) of the
camera integrated VTR.

5 The operation of the system according to this
embodiment will now be described with reference to a flow
chart shown in Fig. 25.

First, the VTR 211 is brought to the reproduction mode
by operating the operation unit 230 shown in Fig. 19. At
10 this time, the system controller 401 of the VTR 211 shown
in Fig. 20 controls each unit of the apparatus according
to control information supplied from the control unit
521 via the I/F 520 and 301. For example, the system
controller 401 controls the capstan motor 403 and the drum
15 motor 404 via the servo circuit 402 and as well as controls
the switches 429, 412a, 412b and 414 via the selection
signal generator 425. The reproducing speed can, of
course, be arbitrarily changed by the aforesaid dial 505
and the pause key 503 in this reproduction mode. The
20 aforesaid change can be realized by changing the rotational
speed of the capstan motor 203. Furthermore, the relative
speed between heads Ha and Hb and the tape T can be
maintained at a constant speed by changing the rotational
speed of the drum motor 404. Furthermore, the difference
25 in the inclination between the trace locus of the head and

1 the track is always absorbed by the head moving mechanisms
Ma and Mb.

In the aforesaid reproducing mode, reproduction video
signals supplied from the recording/reproducing heads Ha
5 and Hb disposed on the drum 206 are made to a continuous
signal via PB terminals of the switches 212a and 212b, the
amplifiers 213a and 213b and the switch 214 before it is
supplied to the video reproducing signal processing
circuit 218. The video signal supplied from the signal
10 processing circuit 218 is transmitted to the monitor 202
shown in Fig. 19 via the PB side of the switch 420 and the
N side of the switch 429.

On the other hand, digital data reproduced by the
audio area AA and the data area PA is converted into an
15 analog signal by the D/A 230 via the switch 214, the switch
215, which is usually always closed, the code data decoder
219 before it is transmitted. In a case of still image
data, it is temporarily stored in the image memory 217 via
the SV side terminal of the switch 251.

20 The operator retrieves a desired picture by operating
a dial 305 or the like while confirming a picture
transmitted from the monitor 202. At the time at which the
desired picture is displayed, the operator operates the
pause key 503 so as to bring the VTR 11 into the still
25 image reproducing mode. When a print specifying button 504

1 is operated in this state, this information is transmitted
from the key operation unit 521 to the system controller
401 via the system controller 232 and the I/F 520 and 301.

The aforesaid operation corresponds to step 1 of a
5 flow chart shown in Fig. 25.

Then, the flow proceeds to step 2 shown in Fig. 25 in
which the size of the print is specified with the operation
unit 521. The operation unit 521 is used to specify
the image quality (step 3), the number of prints (step 4)
10 and the sort (step 5). The aforesaid steps 2 to 4 are
respectively set for each print size. Whether or not there
is another print size is specified with the operation
unit 521 in step 6. If it is present, the flow returns
to step 2. If it is not present, the flow proceeds to step
15 7.

In step 7, data (hereinafter called "print data")
generated in the aforesaid steps 2 to 5 is transferred to
the system controller 401 via the I/F 520 and 301 and is
generated by the print generator 424. In step 8, the
20 aforesaid print data is transmitted to the code data
encoder 208 and is also transmitted to the display signal
generator 422. At this time, a reproduction video signal
transmitted via the switch 420 and the output signal from
the display signal generator 422 which corresponds to the
25 aforesaid print data are mixed with each other by the adder

1 426. A video signal which corresponds to the picture
formed by multiplying an image to be printed and a
character showing print data is digitized by the A/D
converter 427. The output from the A/D converter 427 is
5 supplied to the image memory 417. At this time, the print
data generator 424 receives video signal for one frame from
the A/D converter 427 in accordance with an instruction
made by the memory control circuit 416 and repeats the
aforesaid operation. As a result, the video signal
10 supplied from the image memory 417 is converted into an
analog signal by the D/A converter 423 before it is
transmitted to the monitor 202 via the S side of the switch
429 (step 9).

Then, the operator confirms the picture to be printed
15 and print data while observing the picture displayed on the
monitor 202 so as to check whether or not the contents of
the picture is the contents of the desired picture (step
10).

If the contents are different from those of the
20 desired picture, the flow returns to step 1 and the
operation is again started. If the contents are those of
the desired picture, the flow proceeds to step 11 in which
the aforesaid print data is recorded.

Then, recording of the aforesaid print data will now
25 be described.

1 In usual, if the VTR shown in Fig. 19 is in the
recording mode, the state of the video signal received by
the video recording signal processing circuit 407 is
discriminated to be suitable to be recorded and therefore
5 the video signal is supplied to the switch 410. On the
other hand, the audio signal digitized by the A/D converter
430 or the digitized still image data is read out from the
memory 417 after its data rate has been lowered. Then, the
switch 450 acts to select the AUD terminal in the case of
10 the audio signal or the SV terminal in the case of the
still image. The code data encoder 408 encodes it before
it is supplied to the switch 410 via the switch 409 which
is always closed. Fig. 21 schematically illustrates the
rotational phase of the heads Ha and Hb and the trace
15 position on the tape T. The switch 410 causes the video
recording signal processing circuit 407 to be connected to
the amplifiers 411a and 411b in a period in which the heads
Ha and Hb trace the video area VA. On the other hand, it
causes the code data encoder 408 to be connected to the
20 amplifiers 411a and 411b in a period in which the heads Ha
and Hb trace the audio area AA.

In a case where print data is recorded according to
step 11 shown in Fig. 25, the switch 409 is controlled in
response to a signal C3 supplied to the selection signal
25 generator 425 in such a manner that it is switched on in

1 only a period in which the print data area PA is traced by
the heads Ha and Hb, the print data area PA corresponding
to the postamble unit of the audio-area AA and a unit
of the guard region. Furthermore, the switches 212a and
5 212b are connected to the REC side in only the aforesaid
period in response to the signal C1. As a result, print
data encoded by the code encoder 208 can be recorded to the
print data area PA on the tape T. That is, if a
discrimination is made in step 10 that the contents of the
10 print picture and print data are as desired, print data is
recorded to the print data area PA of the track to which
the video signal, which is being reproduced, has been
recorded in step 11. That is, print data shown in Fig. 22
is recorded to the print data recording area PA of the
15 track to which the print specifying picture is recorded.

Then, the system controller 401 rotates the capstan
motor 403 at the same speed as the normal recording speed
so that the head searching signal is recorded to the
aforesaid header unit for 10 seconds. In usual, a 2.9
20 MHz carrier signal is recorded to the header unit and a
5.8 MHz carrier signal is recorded to the unit which
corresponds to the aforesaid 10 seconds. The 1 bit showing
whether or not the parent picture of the 0-th bit of the
aforesaid word WD0 reproduces the head searching signal in

1 step 10 shown in Fig. 25. If it is 5.8 MHz, "1" is
automatically set.

Then, an operation of printing the print specifying
picture from the tape, to which the print specifying
5 picture is set, will now be described.

When the tape, to which the print specifying picture
has been set, is first loaded in the VTR 211 and a print
command is issued with the key operation unit 321, the
system controller 410 rotates the capstan motor 403 and the
10 drum motor 404 via the servo circuit 402. As a result, the
signal transmitted from the aforesaid print data area PA is
reproduced while winding the tape T at high speed. At this
time, the switches 412a and 412b are connected to the PB
side, while the switch 414 causes the amplifiers 413a and
15 413b to be connected to the code data decoder side. The
switch 415 is switched on at the timing at which the heads
Ha and Hb trace the print data area PA, and the code data
decoder 419 transmits "1" as the head searching control
signal when the aforesaid head unit reproduction signal
20 is 5.8 MHz. In response to the fact that the head
searching control signal has become "1", the system
controller 401 controls the capstan motor 403 in such a
manner that the tape is run in the opposite direction to
the direction at the time of the recording operation at the
25 same speed as that at the time of the recording operation.

1 In this state, the code data decoder 419 reproduces
data supplied from the data unit. If all of the 4-bit
data of data shown in Fig. 24 showing the number of prints
are not zero, the system controller 401 stops running of
5 the tape T. At this time, either of a mode in which
running of the tape T is stopped in only a period in which
non-printed data is being detected or a mode in which
running of the tape T is stopped regardless of whether or
not the data has been printed may be set.

10 The heads Ma and Mb of the head moving mechanism trace
the track to which the specified pictures have been
recorded in the state where the tape T is stopped. The
reproduction signal at this time is received by the image
memory 417 via the video reproducing signal processing
15 circuit 418, the adder 426 and the A/D converter 427.
Print data is, via the code data decoder 419, received by
the printer control signal generator 421 acting as an
interface. When the aforesaid receiving operation has been
completed, data stored in the image memory 417 and printer
20 control data transmitted from the printer control signal
generator 421 are transferred to the printer data bus 428.
The printer 203 prints video data supplied via the data bus
228 according to the control data. When the printing
operation is completed, the printer 203 transmits data
25 showing the completion of the printing operation to the

1 data bus 428. The print completion data supplied from the
printer 203 is transmitted to the system controller 401 via
the printer control signal generator. In accordance with
this, the VTR performs the next operation.

5 That is, when the print completion data is supplied to
the VTR, rewriting of print data to "0" is performed if the
first bit of the word WD0 is "1". Since the operation of
the VTR at this time is the same as that to be performed at
the time of recording print data, its description is
10 omitted here. Then, retrieval of the next specified
picture is performed in such a manner that, in a case where
the parent picture is present, the flow starts at the step
in which the tape is run at the same speed as that at the
time of the recording operation in the opposite direction.
15 In a case where it is not present, the flow starts at the
step in which the tape is run at a high speed in the
forward direction.

Then, an example of application of the print to be
transmitted from the system according to this embodiment is
20 shown in Figs. 26 to 28. Figs. 26 and 27 illustrate
examples of an equal-magnification printing operation,
wherein the aforesaid print data of WD0 to WD4 is recorded
in the form of a bar code in the lower left unit of the
print. If the sensor unit 522 of the printer 203 has
25 the bar code reading function, the original video signal

1 can be retrieved on the tape T from this print. Fig. 28
illustrates a multiple picture to be printed out in a case
where all of data about the number of prints of WD1 to WD4
are "1". The address of the picture such as the time code
5 on the tape is printed in the lower right unit of the
contracted picture. If the VTR has a function of
retrieving the tape T by using the time code, the original
video signal on the tape T can be retrieved similarly.

In the system including the VTR thus constituted, each
10 print picture can be automatically printed after all of
the pictures to be printed have been selected. Therefore,
the handling facility of the system of this type can be
significantly improved.

Furthermore, a picture, which has been once printed,
15 can be again printed by reproducing print data on the tape.

In addition, if the retrieving marks for head-
searching are added to a predetermined number of pictures
adjacent to the print specified picture, the tape can be
run at high speed at the time of retrieving the print
20 specified picture.

Since the frame No. from the start position of the
tape can be recorded to the time code in the aforesaid WD0
to WD4, the video signal on the tape T and the recording
unit of the PCM-SV can be easily retrieved by using the
25 aforesaid information. If the additional information such

1 as date is not required, it can be omitted by switching off
the switch 39.

As described above, the structure according to this
embodiment comprises an image signal reproducing unit
5 having an image signal reproducing device and a first
digital interface unit for transmitting the reproduction
image signal supplied from the reproducing device as
digital data, an operation member for retrieving the
picture of the reproducing device, a second digital
10 interface unit for supplying control data generated by
the operation member to the reproducing device and a
printer capable of printing the reproduction image signal
supplied from the reproducing device, wherein the operation
member is disposed in the printer unit. Therefore, a
15 variety of operations from the printer side can be
performed. As a result, searching can be satisfactorily
performed even if an exclusive retrieving (switch or the
like) member is not provided in the VTR unit. It is
significantly effective in a case where it is employed in a
20 camera integrated VTR the size of which has been reduced
recently. Furthermore, since the digital interface unit
is provided for both the VTR unit and the printer
unit, a complicated wiring can be omitted and the
connector for connecting the VTR and the printer can be
25 reduced in size and simplified. Therefore, a further